Having thus described the invention, what is claimed as new and secured by Letters Patent is:

Claims

1. A method of producing polymer-coated fibers, said method comprising:

combining a continuous roving of coated fibers with a molten polymer by means of a heating chamber adapted to house at least one nozzle including a plurality of orifices for ejection of the molten polymer upon and by which the coated fibers are spread;

and cooling the molten polymer upon the continuous roving of coated fibers by means of a cooling chamber to form a contiguous polymer-coated fiber.

2. The method of Claim 1 wherein the temperature of the heating chamber is brought to a temperature at which the molten polymer will flow.

3. The method of Claim 2 wherein the temperature of the heating chamber is brought to at least about 30°C above the melting temperature of the molten polymer.

4. The method of Claim 1, wherein the molten polymer is ejected in a manner sufficient to forcibly spread each fiber within the continuous roving of coated fibers without removal of coating on each fiber.

5. The method of Claim 1 wherein each fiber is a coated carbon fiber.

6. The method of Claim 5 wherein each fiber is a metal coated fiber.

7. The method of Claim 6 wherein each metal coated fiber is coated with a metal selected from the group consisting of nickel, nickel alloy, silver, silver alloy, aluminum, aluminum alloy, copper, copper alloy, monel metal, monel metal alloy, tin or tin alloy.

8. The method of Claim 1 wherein the molten polymer is a thermoplastic.

9. The method of Claim 1 wherein the molten polymer is a thermoset.

10. The method of Claim 1 wherein the molten polymer is a molten liquid crystal polymer.

11. The method of Claim 1 wherein the nozzles comprises at least one set of nozzles.

12. The method of Claim 11 wherein the nozzles comprises four sets of nozzles.

13. The method of Claim 12 wherein the nozzles are rotating nozzles.

14. The method Claim 1 wherein the nozzles are connected to a pressurized reservoir of the molten polymer.

15. The method of Claim 1 wherein the cooling step is accomplished by an inert gas blown onto the continuous roving of coated fibers to solidify the molten polymer.

16. The method of Claim 15 wherein the inert gas is selected from nitrogen, helium and argon.

17. The method of Claim 1 further including the step of cutting the contiguous polymer-coated fiber into pellets.

18. The method of Claim 1 further including the step of rolling the contiguous polymer-coated fiber into a wound length.

19. A method of producing polymer-coated, metal-coated fibers, said method comprising:

combining a continuous roving of metal-coated fibers with a molten polymer stream by means of a heating chamber adapted to house at least one nozzle including a

plurality of orifices for ejection of the molten polymer upon and by which the fibers of the continuous roving of metal-coated fibers are spread via only force of the molten polymer stream and with minimal damage of the fibers of the continuous roving of metal-coated fibers;

cooling the molten polymer upon the individual fibers of the continuous roving of fibers by means of a cooling chamber to form a contiguous polymer-coated, metal-coated fiber;

and recovering the polymer-coated, metal-coated fibers.

20. The method of Claim 19 wherein the temperature of the heating chamber is brought to a temperature at which the molten polymer will flow.

21. The method of Claim 20 wherein the temperature of the heating chamber is brought to at least about 30°C above the melting temperature of the molten polymer.

22. The method of Claim 19 wherein each metal coated carbon fiber is coated with a metal selected from the group consisting of nickel, nickel alloy, silver, silver alloy, aluminum, aluminum alloy, copper, copper alloy, monel metal, monel metal alloy, tin or tin alloy.

23. The method of Claim 19 wherein the molten polymer is a thermoplastic.

24. The method of Claim 1 wherein the molten polymer is a thermoset.

25. The method of Claim 19 wherein the molten polymer is a molten liquid crystal polymer.

26. The method of Claim 19 wherein the nozzles comprises at least one set of nozzles.

27. The method of Claim 25 wherein the nozzles comprises four sets of nozzles.

28. The method of Claim 26 wherein the nozzles are rotating nozzles.

29. The method Claim 19 wherein the nozzles are connected to a pressurized reservoir of the molten polymer.

30. The method of Claim 19 wherein the cooling step is accomplished with an inert gas blown onto the continuous roving of fibers to solidify the molten polymer.

31. The method of Claim 29 wherein the inert gas is selected from nitrogen, helium and argon.

32. The method of Claim 19 wherein the retaining step includes cutting the contiguous polymer-coated fibers into pellets.

33. The method of Claim 19 wherein the retaining step includes forming the contiguous polymer-coated fibers into a wound length.

34. The method of Claim 1, wherein a molten polymer reinforced with fine particulates is fed from the nozzle to wet the fibers and to form a polymer composite containing both particulate and fiber reinforcement to form a hybrid composite.

35. The method of Claim 34, wherein the size of the molten polymer particulates is less then 0.35mm.

36. The method of Claim 34, wherein the particulate is at least one ceramic particulate chosen from a group consisting of silicon carbide, alumina, aluminum nitride, silicon dioxide, carbon, silicon nitride, titanium diboride, titanium carbide, tungsten carbide, zirconia, beryllia, boron and boron carbide.

37. The method of Claim 34, wherein the particulate is at least one metallic particulate chosen from a group consisting of nickel, silver, monel, tin, copper, aluminum, steels and chromium.

38. The method of Claim 1, wherein a molten polymer reinforced with nano-particles is fed from the nozzle to form a polymer composite with both fiber and nano-particles reinforcement to form a hybrid composite.

39. The method of Claim 38, wherein the nano-particles are at least one nano-particle chosen from a group consisting of silicon carbide, alumina, aluminum nitride, silicon dioxide, carbon, silicon nitride, titanium diboride, titanium carbide, tungsten carbide, zirconia, beryllia, boron and boron carbide.

40. The method of Claim 38, wherein the nano-particles are at least one nano-particle chosen from a group consisting of nickel, silver, monel, tin, copper, aluminum, steels and chromium.

41. The method of Claim 1, wherein a molten polymer reinforced with nano-clay is fed from the nozzle to form a polymer composite with both fiber and nano-clay reinforcement to form a hybrid composite.

42. An apparatus for producing polymer-coated, metal-coated fibers said apparatus comprising:

a reel means for providing movement of a roving of metal-coated fibers;

at least one nozzle including a plurality of orifices for spreading each metal-coated fiber of the roving without making contact with each metal-coated fiber of the roving and spraying a molten polymer stream upon the roving;

a heating chamber for housing the sprayer nozzles; and

a cooling chamber for cooling the molten polymer on the roving;

wherein the molten polymer stream is ejected from each one of the orifices of the sprayer nozzles in a manner sufficient to forcibly spread the metal-coated fibers without removal

of metal-coating therefrom, and the molten polymer is cooled on the roving by the cooling chamber to form a contiguous polymer-coated, metal-coated fibers.

43. The apparatus of Claim 42 further comprising a cutting means adapted to render pellets from the contiguous metal-coated fiber and polymer composite.

44. The apparatus of Claim 42 wherein the reel means includes a bobbin on which the roving is wound and a set of fiber pick-up wheels in contact with the bobbin.

45. A polymer-coated, metal-coated fiber composite comprising a plurality of metal-coated fibers interspersed within an encasement of polymer wherein metal-coating of each metal-coated fibers is substantially undamaged.

46. The polymer composite of Claim 45 wherein each fiber is a coated carbon fiber.

47. The polymer composite of Claim 46 wherein each coated carbon fiber is coated with a metal selected from the group consisting of nickel, nickel alloy, silver, silver alloy, aluminum, aluminum alloy, copper, copper alloy, monel metal, monel metal alloy, tin or tin alloy.

48. The polymer composite of Claim 45 wherein the composite is continuous.

49. The polymer composite of Claim 45 wherein the composite is pelletized.

50. The method according to claim 1 or 19, wherein the size of the orifices for ejection of the molten polymer is at least 0.35mm.

51. The method according to claims 1 or 19, wherein the nozzle tubes have at least 3 rows of orifices.

52. The method according to Claims 50, wherein the rows of orifices are spaced to cover at least 45° angle of spread.

53. The method according to claims 1 or 19, wherein the first nozzle tube ejects a first polymer and the at least one sequence nozzle tube ejects a second polymer in the event that the surface of the metallic coated fiber needs to be functionalized by a first polymer prior to covering of the fibers by the matrix polymer.

54. The method according to claims 1 or 19, wherein the nozzle tubes are connected to separate individual pressurized reservoirs in the case that two types of polymers are spread onto the fibers,